CLAIMS

1.   A method of delay change determination in an integrated circuit design including a stage with a victim net and one or more aggressor nets capacitively coupled thereto, the method comprising:

determining a nominal victim net signal transition arrival time at an output of a victim net receiver;

determining a noisy victim net signal transition arrival time at the output of the victim net receiver, wherein the noise is due to one or more aggressors; and

determining a delay change based upon nominal and noisy victim signal transition arrival times at the receiver output.

2.   A method of delay change determination in an integrated circuit design including a stage with a victim net and one or more aggressor nets capacitively coupled thereto in an interconnect network, the method comprising:

(1)   determining a nominal (noiseless) victim net signal transition using a method including the steps of,

providing a nominal victim signal transition waveform on a victim driver output based on a signal transition on the victim driver input;

propagating the nominal victim signal transition waveform from the victim driver output to a victim receiver input via the interconnect network; and

further propagating the nominal victim signal transition waveform from the victim receiver input to a victim receiver output;

(2)   determining a noisy victim net signal transition using a method including the steps of,

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providing a noisy victim signal transition waveform on the victim driver output based on the signal transition on the victim driver input and an aggressor-induced current waveform;

propagating the computed victim driver output waveform from the victim driver output to the victim receiver input via the interconnect network so as to produce a propagated victim voltage waveform at the victim receiver input; and

providing an aggressor-induced voltage waveform to the victim receiver input;

computing a noisy victim receiver input voltage waveform using the propagated victim voltage waveform and the aggressor-induced voltage waveform; and

propagating the noisy victim receiver input voltage waveform from the victim receiver input to the victim receiver output; and

(3)   determining a delay change based upon nominal and noisy victim signal transition arrival times at the receiver output.

3.   A method of determining aggressor-induced delay change in a victim net of a stage of an integrated circuit design, comprising:

providing an input and output voltage dependent current model of a driver of the victim net;

producing a model of an interconnect network of the stage, which can be used to propagate a waveform from an output of the driver model to an input of a victim net receiver;

determining nominal (noiseless) delay in the stage by determining delay associated with the steps of,

providing a signal transition to the driver model;

using the interconnect model to propagate a driver model output waveform, resulting from the provided signal transition, from the driver model output to the receiver input;

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determining noisy delay in the stage by determining delay associated with the steps of,

providing a signal transition to the driver model;

providing at least one aggressor-induced current waveform to an output of the driver model;

using the interconnect model to propagate a driver model output waveform, resulting from the provided signal transition and from the at least one aggressor-induced waveform, from the driver model output to the receiver input;

providing at least one aggressor-induced voltage waveform to an input of the receiver; and

determining a difference between the nominal delay and noisy delay.

4.   The method of claim 3,

wherein the output current-dependent model of a driver of the victim net includes a ViVo model.

5.   The method of 3,

wherein the output current-dependent model of a driver of the victim net includes a ViVo model; and

wherein the interconnect model includes a Π-load.

6.   The method of 3,

wherein determining nominal delay further includes propagating the propagated driver model output waveform to an output of the receiver; and

wherein determining noisy delay in the stage includes propagating the propagated driver output waveform and the provided at least one aggressor induced waveform to an output of the receiver.

7.   A method of producing an aggressor-induced victim net waveform, for use with an integrated circuit design that includes a stage with a victim net capacitively coupled to one or more aggressor nets through an interconnect network, a victim net driver and a victim net receiver, the method comprising the steps of:

producing a computational model of the interconnect network, which model can be used to compute a victim net waveform from an aggressor net waveform; and

inputting the aggressor net waveform to the computational model.

8.   A method of producing an aggressor-induced victim net waveform, for use with an integrated circuit design that includes a stage with a victim net capacitively coupled to one or more aggressor nets through an interconnect network, a victim net driver and a victim net receiver, the method comprising the steps of:

producing a computational model of the interconnect network, which model can be used to compute a victim net waveform form an aggressor net waveform;

pre-computing an aggressor waveform corresponding to a prescribed aggressor signal transition on at least one aggressor net, which takes account of the influence of at least one other net capacitively coupled to the at least one aggressor net; and

inputting the pre-computed aggressor waveform to the computational model.

9.   The method of claim 8,

wherein the prescribed aggressor signal transition is a fastest aggressor net signal transition.

10.   A computer readable medium encoded with a waveform produced by the method of claim 8.

11.   A computer readable medium encoded with a waveform produced by the method of claim 9.

12.   A method of aligning one or more aggressor signals with a victim signal transition for use with an integrated circuit design that includes a stage, with a victim net capacitively coupled to one or more aggressor nets through an interconnect network, a victim net driver and a victim net receiver, the method comprising the steps of:

providing at least one aggressor induced victim net waveform associated with an aggressor net, wherein the at least one provided waveform is induced in the victim net by a prescribed aggressor signal in the associated aggressor net;

determining respective delays associated with a victim net signal transition from the victim driver to the victim receiver, while the at least one aggressor induced victim net waveform is imparted to the victim net, for each of multiple alignments of the at least one provided waveform with the victim net signal transition;

interpolating a next alignment of the victim net signal transition and the at least one provided waveform based upon previously determined delays, wherein the next alignment is selected to result in a worse delay than prior alignments;

determining a respective next delay associated with the next alignment;

repeating the interpolating step and the determining a respective next delay step until a prescribed limit is reached.